Nov. 18, 1941. J. HOFMANN 2,263,088

PIANO ACTION

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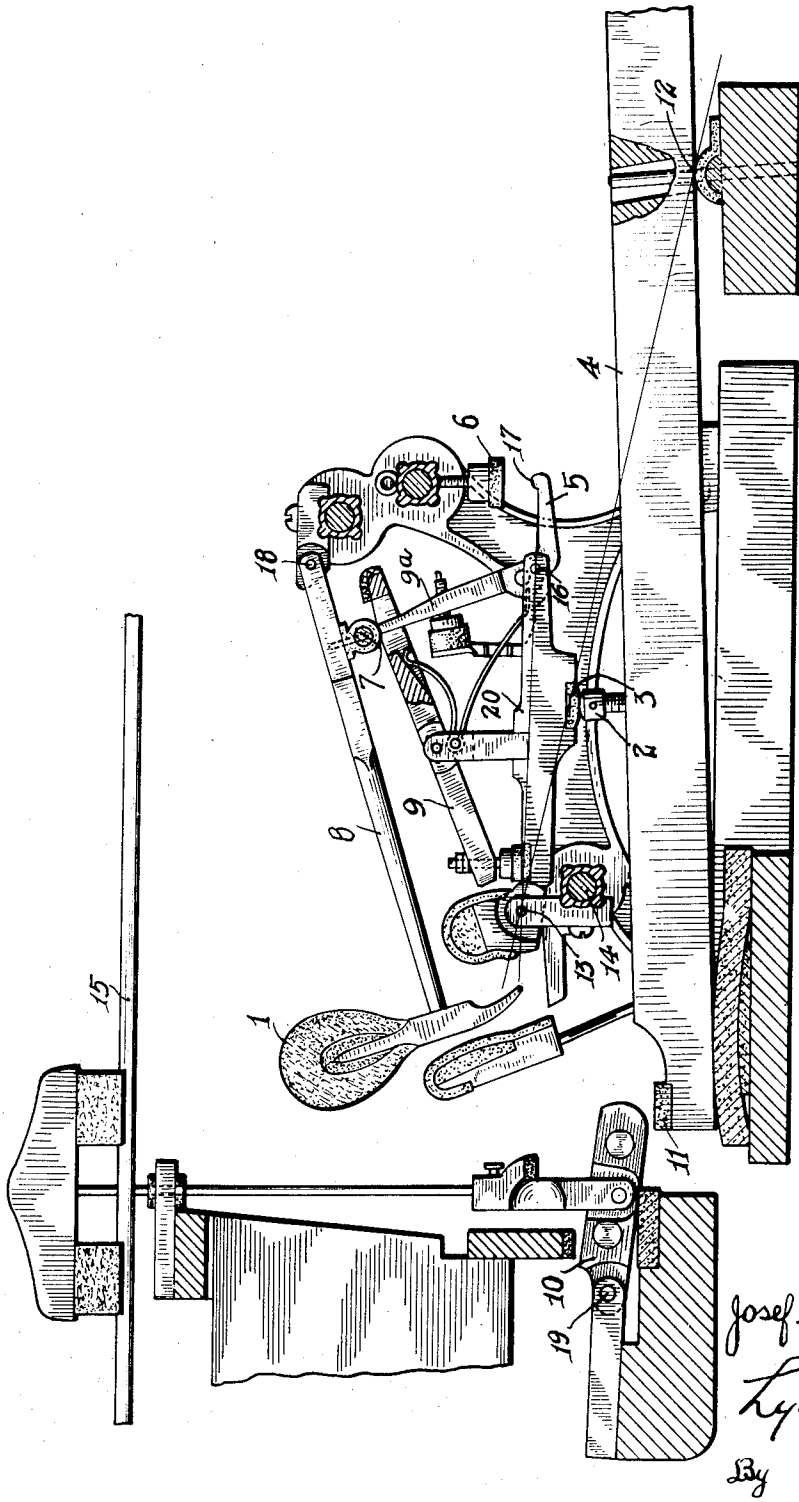

Fig. 1

Inventor
Josef Hofmann
Lyon & Lyon
By Attorneys

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Fig. 3

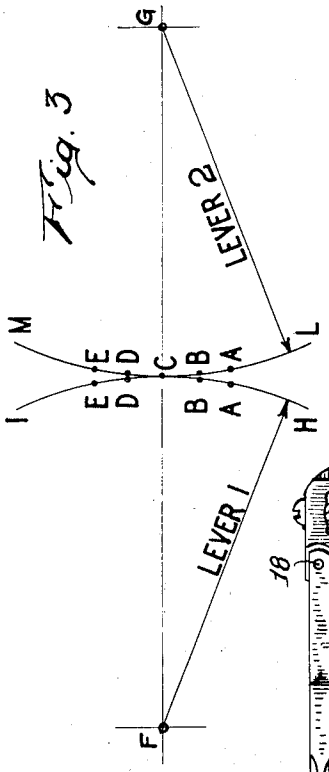

Fig. 2

Inventor
Josef Hofmann
By Lyon & Lyon
Attorneys

Patented Nov. 18, 1941

2,263,088

UNITED STATES PATENT OFFICE

2,263,088

PIANO ACTION

Josef Hofmann, Hollywood, Calif.

Application October 14, 1940, Serial No. 361,066

4 Claims. (Cl. 84—239)

This invention relates to piano actions, and more particularly to the construction and arrangement of a connecting lever system between the keys and the hammers and dampers which is so constructed and arranged as to reduce to a minimum the undesirable friction between moving parts and thus obtain a piano action which will operate with a quicker key return, respond to the most delicate touch, remain substantially unaffected by climatic conditions, and be less subject to wear.

Much has been written in the past dealing with methods relative to the movement of the key and the main actuating lever (support) but, to the best of my knowledge, in no instance has a uniform arrangement such as I have worked out, been applied to all moving parts by means of which the sliding movement and the resultant friction between all moving parts is reduced to a minimum and thus a practically frictionless piano action brought about.

In order to achieve this end, I have so arranged the balance points of all contacts between actuating levers that the distance of said points of contact is the same on one side of the straight line, connecting the lever pivot points at the start of the travel, as it is at the opposite side of said line at the termination of the travel, which arrangement results in the least possible sliding movement between points of contact and consequently in the least possible friction.

The four points where this principle is applicable are:

(1) The point of sliding movement at the pilot or capstan screw.

(2) The point of sliding movement of the tender against the tender button.

(3) The point of the sliding movement of the knuckle as carried by the hammer shank along the repetition lever and the jack, and

(4) The point of sliding movement of the damper lever along the key damper pad at the rear end of the key.

Other objects and advantages of this invention it is believed will be apparent from the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a diagrammatic side elevation partly in vertical section of one unit of a piano action illustrating the same in the neutral or starting position.

Figure 2 is a similar side elevation illustrating the parts in the actuated or hammer-striking position.

Figure 3 is a diagrammatic view illustrating the principle upon which my invention is based.

The principle as set forth hereinabove is adopted in my piano action in the following manner:

The key 4 is pivotally supported in the ordinary manner and the center of its pivot is located at a point indicated at 12. Carried by the key 4 rearwardly from the pivot center 12 is the capstan screw or pilot 2 which provides a sliding contact with the support pad 3 of the repetition mechanism. The support 20 is pivotally connected at a fixed pivot 13 from the supporting rail 14. The positions of the pivots 12, 13, and the point of contact between the pilot 2 and the support pad 3 are, as illustrated, so arranged that when the key 4 is in its starting position, the point of contact between the pilot 2 and the support pad 3 is a distance below the line drawn between the pivot centers 12 and 13, substantially the same as the distance of the point of contact between the pilot member 2 and the support pad 3 above the same line when the key 4 is fully depressed. In the same manner, the pivotal arrangement between the pivot 13 and the pivot pin 16 and the point of sliding contact 17 of the tender 5 and the button 6 is so arranged that at the start of the operation or of the said contact, the line drawn between the pivot centers 13 and 16 passes below the point 17 in contact with the cushion 6 a distance equal to the distance that said point of contact 17 is below the said line drawn between the said pivots when it has reached the end of its movement.

It will be apparent that in this case the two pivots 13 and 16 are located adjacent each other and that the point 17 lies outside so that the relative distances as hereinabove set forth are measured from an extension of the line drawn between the pivot centers 13 and 16. In the case of the positioning of the capstan screw 2, this pivot lies between its relative pivot centers 12 and 13.

In the third instance where my invention finds application, the pivot points considered are the pivot 13, around which the support mechanism oscillates the pivot pin 18 around which the hammer 1 is swung, and the point of sliding contact between the knuckle 7 and the repetition lever 9 and the jack 9^a. The parts are so proportioned in this case as to produce the same result, namely, that the point of contact between the knuckle 7, the repetition lever 9 and jack 9^a at the start

of the operation is below the line drawn between the center of the pivots 13 and 18, and at the completion of the operation lies substantially the same distance above the said line.

The fourth instance in the piano action mechanism where my invention finds application is the point of sliding contact of the damper lever 10 with the damper pad 11 at the rear of the key 4. The lever mechanism is so proportioned, and the points of the pivots are so positioned that the pivot 19 around which the damper lever 10 swings, and the pivot 12 around which the key 4 oscillates, are so located with relation to the said points of contact that the point of contact between the end of the pad 11 at the end of the key 4 with the end of the damper lever 10 is located a distance below the line drawn through the center of the pivots 12 and 19, which distance is substantially the same as the distance between the said point of contact above the said line at the completion of said movements.

It will be apparent from the foregoing that in each case the point of sliding contact is located in such manner that considering, for example, the first instance of application of my invention, e. g., the sliding movement of the capstan screw or pilot 2, that the radii drawn between the points G and C and F and C (Figure 3) intersect at a point C on the line FG, and when the capstan screw 2 or its point of pivotal contact with the support pad 3 of the key is located at the point C, there is no sliding movement, but a simple rolling action. It will be apparent also from the diagram (Figure 3) that as the point of contact between the capstan screw 2 and the support pad 3 of the key 4 passes over or below the line FG, that the magnitude of sliding movement may be ascertained by the distance apart of the peripheries of the two circles described using the aforesaid radii as the radii of the two circles. As illustrated in Figure 3, these peripheries are indicated by the curved lines HI and LM. When the starting point at which the action commences is located with the capstan screw 2 a distance below the line FG, which is equal to the distance of the capstan screw above the line FG at the completion of the action, the magnitude of sliding movement will be the distance DD plus the distance BB but in reverse directions. It will thus be apparent with the levers and their centers so proportioned and located, that the sliding movement is reduced to a minimum and that the friction is also reduced to a minimum.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. In a piano action, the combination of a key having a pivotal support, a repetition assembly having a fixed pivot support, means providing a moving contact between the key and the repetition assembly, said means being disposed intermediate the points of pivot of the key and repetition assembly, the moving contact being situated so that the point of contact provided thereby between the key and repetition assembly lies below a line drawn between the key pivot and the repetition assembly pivot at the start of movement of the key substantially the same distance as the said point of contact lies above a line drawn between the said key pivot and repetition assembly pivot at the completion of the operation of moving the key.

2. A piano action comprising a lever, means pivotally supporting said lever, a second lever, means pivotally supporting said second lever, said levers having an inactive position and being adapted to be actuated to an active position, and means between said levers arranged to transmit movement of one of said levers to the other of said levers, said last-mentioned means including surfaces in sliding contact, the point of contact of said sliding surfaces normally lying a given distance below a line drawn between the pivot points of said levers when said levers are in their inactive position and lying above said line a distance equal to said given distance when said levers are actuated to assume their active position.

3. In a piano action, the combination of a hammer shank having a pivotal support and carrying a knuckle, a repetition assembly including a repetition lever and a jack and having a fixed pivot support, the knuckle having sliding movement over the said lever and jack, the point of sliding contact between the knuckle, the repetition lever and jack being disposed between the points of pivot of the hammer shank and repetition assembly, the sliding contact being so situated that the point of contact provided thereby between the knuckle and the repetition lever lies below a line drawn between the hammer shank pivot and the repetition assembly pivot at the start of movement of the hammer shank substantially the same distance as the said point of contact lies above a line drawn between the hammer shank pivot and the repetition assembly pivot at the completion of movement of the hammer shank.

4. In a piano action, the combination of a tender having a pivotal support, a repetition assembly having a fixed pivotal support, a tender button, means providing a moving contact between the tender and said tender button, said means being disposed outside of the points of pivot of the tender and repetition assembly, the moving contact between the tender and the tender button being situated so that the point of contact provided thereby between the tender and the tender button lies below a line drawn between the tender pivot and the repetition assembly pivot at the start of movement of the tender substantially the same distance as the said point of contact lies above a line drawn between the said tender pivot and the repetition assembly pivot at completion of the operation of the tender.

JOSEF HOFMANN.